VM 750 / 960 / 1260

Heavy Duty Vertical Machining Center

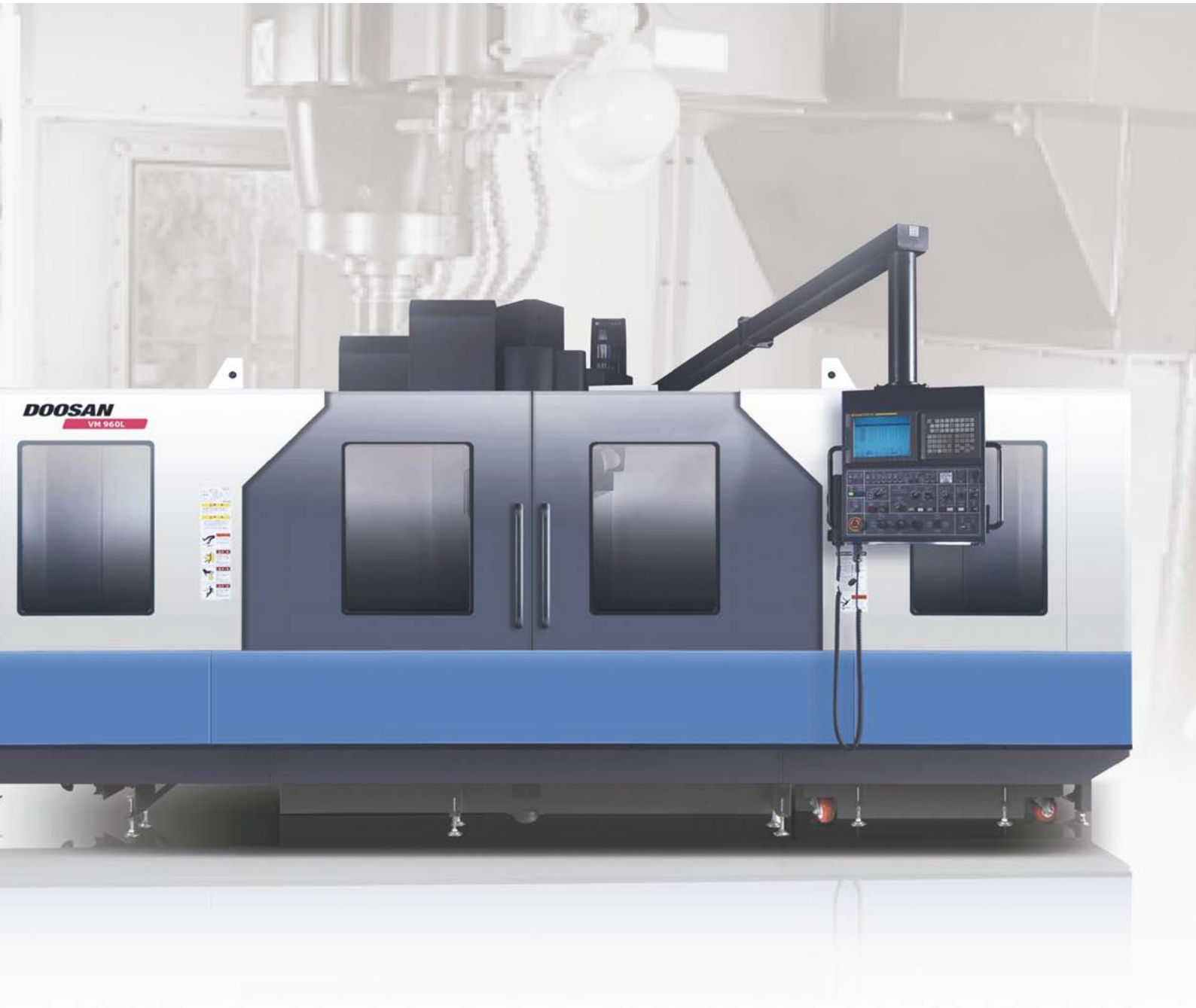
Doosan Machine Tools

Optimal Solutions for the Future

VM 750 / 960 / 1260

Heavy Duty Vertical Machining Center

The VM 750/960/1260 series of Vertical Machining Centers are built to world-class standards to ensure world-class results. Its powerful drives, heavy duty construction and unsurpassed rigidly provide exceptional precision and years of trouble free performance.

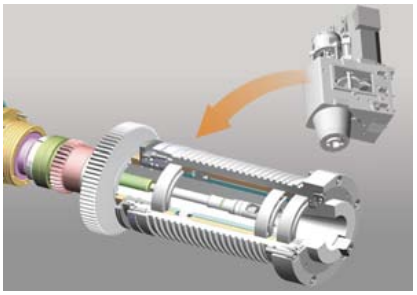


Speed Spindle

High speed spindle of high quality and rigidity
helps increase the efficiency and performance of the machine.

VM 750 / 960 / 1260

Gear Type



Max. spindle speed

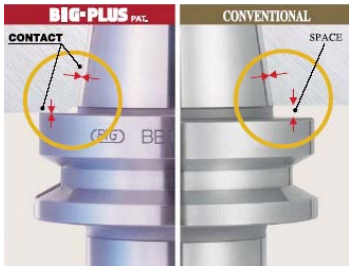
6000 r/min std. **8000** r/min opt.

Motor (continuous / 30 min)

18.5/15 kW (25/20 Hp)
(VM750(L),VM960(L))

22/18.5 kW (30/25 Hp)
(VM1260)

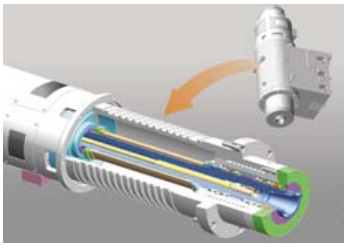
2- face locking tool system std.



2면 구속 공구 (BIG PLUS) 표준 적용

- **Powerful Cutting of Large Objects**
  Powerful processing capability of large objects with maximum torque is offered with 2 stage gear drive.
- **High Speed Tapping** std.
  Standard adoption of rigid tap allows high speed tapping without the tap holder.
- **Rigidity and Stability**
  Rigid angular contact bearing is adopted to assure rigidity and stability by maintaining the rigidity even during powerful cutting.

Built in Type opt.



Max. spindle speed

12000 r/min

Motor
(continuous / 30 min)

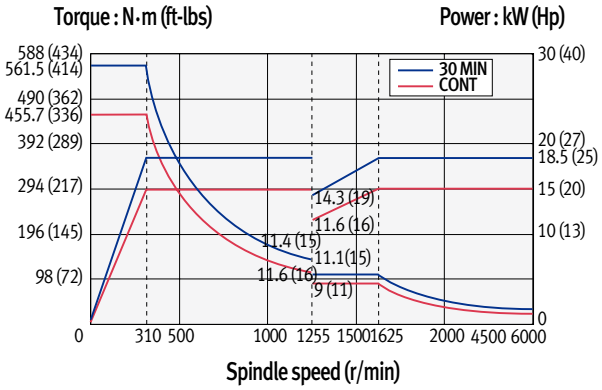
30/25 kW
(40/34 Hp)

- **Rigid and Precise Mandrel**
  Adoption of 100 diameter rigid ceramic bearing and oil supply (oil mist) method assure high precision even during the high speed rotation.
- **Highest Speed Mandrel in the Class**
  Adoption of low vibration built-in motor offers optimum molding with highest mandrel speed (12000 r/min) and highest torque of 419.44 N·m in the same class.

Spindle power-torque diagram

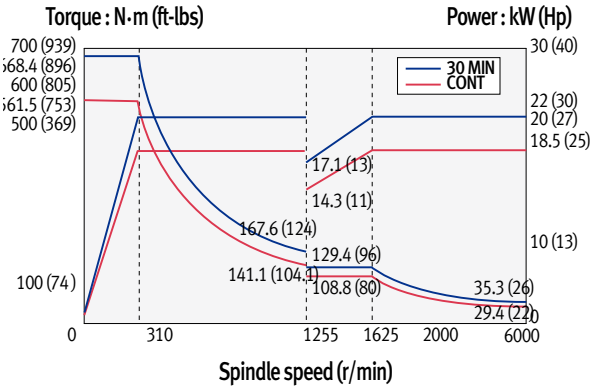
Gear Type

VM 750(L), VM 960(L) **6000** r/min



VM 1260 **6000** r/min

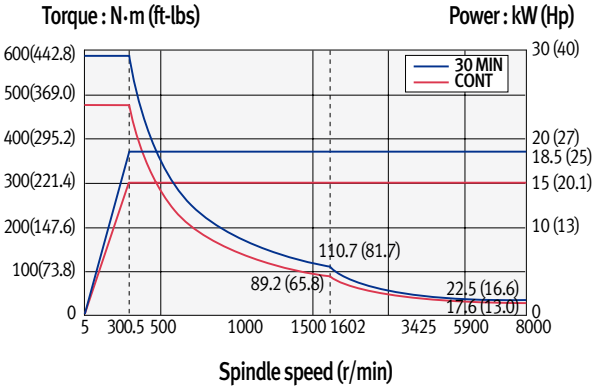
VM 750(L), VM 960(L) **6000** r/min 선택



Built in type

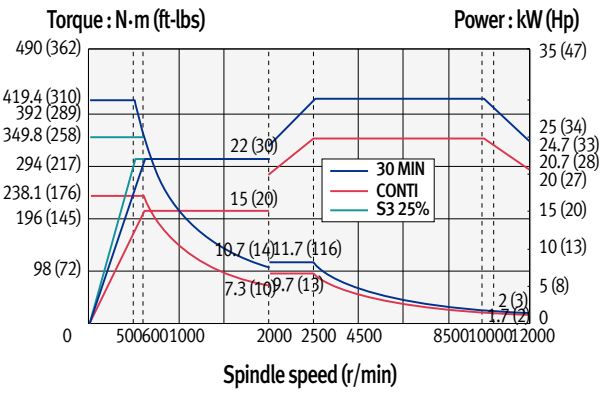
VM 750(L), VM 960(L), VM 1260

8000 r/min 선택



VM 750(L), VM 960(L), VM 1260

12000 r/min 선택



Machine Structure

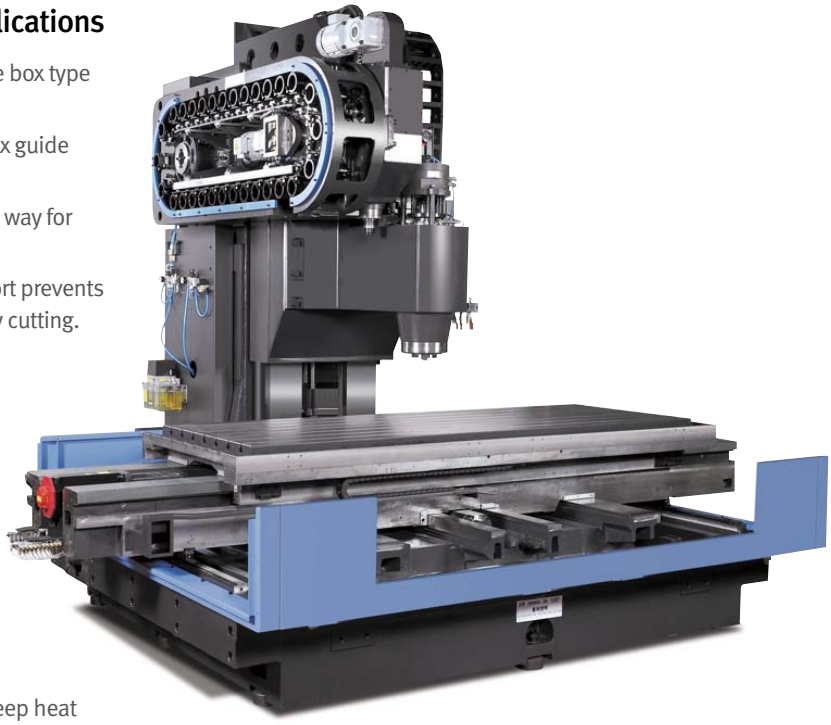
Stable bed and column assembles are designed for high speed and heavy duty machining.

VM 750 / 960 / 1260

Machine Structure

Rigid Construction for heavy duty applications

- The rigidity is increased by rationally arranging the box type structure of bed, column and saddle.
- Rigidity and stability are assured with the wide box guide structure.
- The mandrel head is supported by the wide guide way for the stable cutting performance.
- Wide z-side slide and wide y-side transport support prevents skewing and makes it suitable for powerful, heavy cutting.

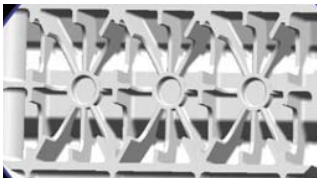


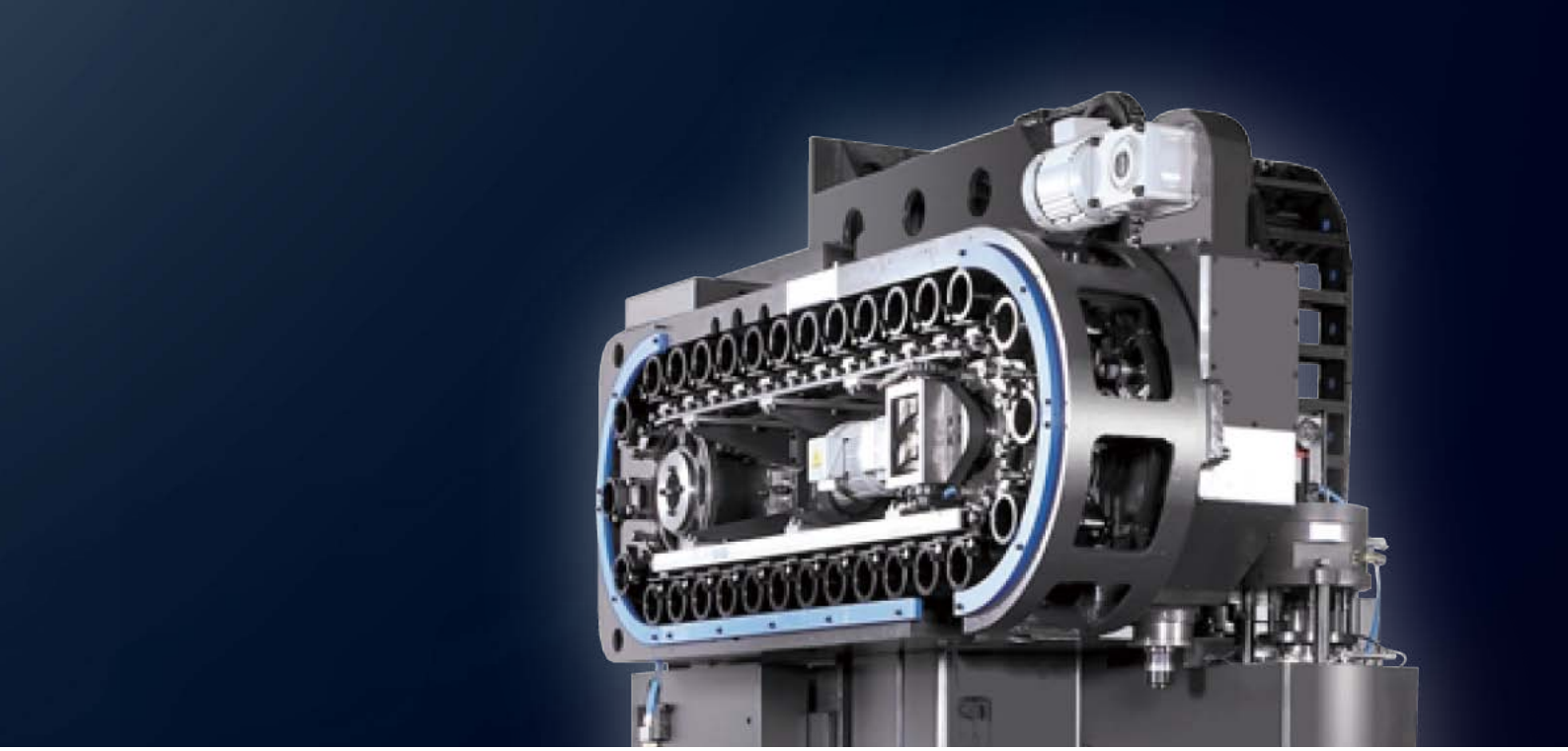
Exceptionally durable all in one single frame construction

The widely spaced bed slides are high frequency deep heat treated providing outstanding performance during heavy duty interrupted cutting operations.

Radial rib structure

The processing quality is improved as the weight is reduced and shaking with processing thrust during intermediate cutting is absorbed.





Table

Wide range and driverse work-pieces

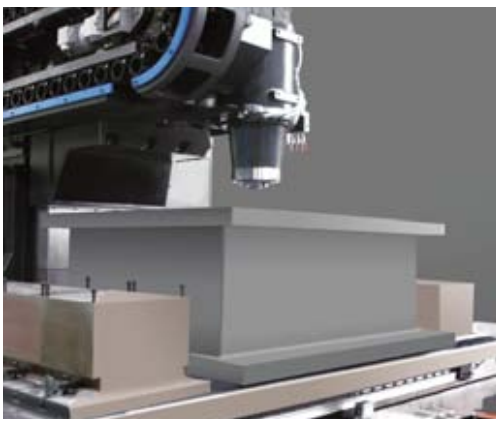
The large size X-axis table, allows mounting and working of wider and more diverse work-pieces.

X x Y axis

1600 x 800 mm (63.0 x 31.5 inch)	(VM 750)
1900 x 800 mm (74.8 x 37.4 inch)	(VM 750L)
2400 x 950 mm (94.5 x 37.4 inch)	(VM 960)
2600 x 950 mm (102.4 x 37.4 inch)	(VM 960L)
2800 x 1260 mm (110.2 x 49.6 inch)	(VM 1260)

Table loading capacity

3000 kg (6613.8 lb)	(VM 750)
3500 kg (7716.2 lb)	(VM 750L)
4000 kg (8818.4 lb)	(VM 960)
4500 kg (9920.8 lb)	(VM 960L)
8000 kg (17636.7 lb)	(VM 1260)



Rapid Traverse

All guideways are wide box type for unsurpassed long-term rigidity and accuracy. The guideways are induction hardened and precision ground. Fluroplastic resin, Rulon® 142, is boned to the mating surfaces and then hand scraped to ensure perfect fit and tolerances. The fluroplastic resin with the forced way lubrication combine to provide a low friction surface and virtually eliminates guide wear. All guideways are fully protected from chips and damage.

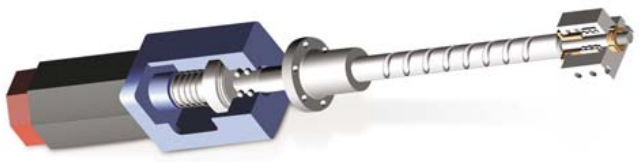
Rapid traverse rate (VM 750/960/1260)

20/16/12 m/min (787.4 / 629.8 / 472.4 ipm)

Ball Screw & Driver

Large diameter ball screw for powerful cutting

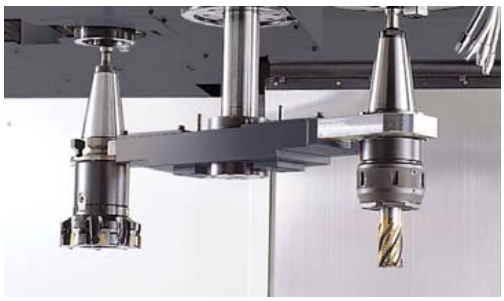
- Double Edge Fixed Type Transport Structure
- Double Anchor Method of High Accuracy Pretension
- Fast Response



Minimized Non Cutting Time

Faster tool change time using cam increases productivity than previous model.

Automatic tool changer



Tool change time (T-T-T)

2.5 s

Tool magazine

Tool storage capacity

30 tools std.

40 tools (VM 750/960 std. VM 1260 opt.)

Eco Friendly & Ergonomic

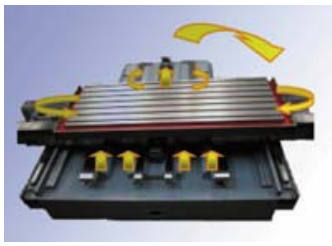
Centralized deployment of repair parts

Storing parts for repair in a single place allows you to repair the machine more easily

No need for frequent fill-up of lubricant

The oil filter helps enhance the life of the tools and productivity by separating lubricant from water. (Large 12L)

Lubricant recovery structure



This helps improve the cleanliness and life of cutting oil.

Coolant gun opt.

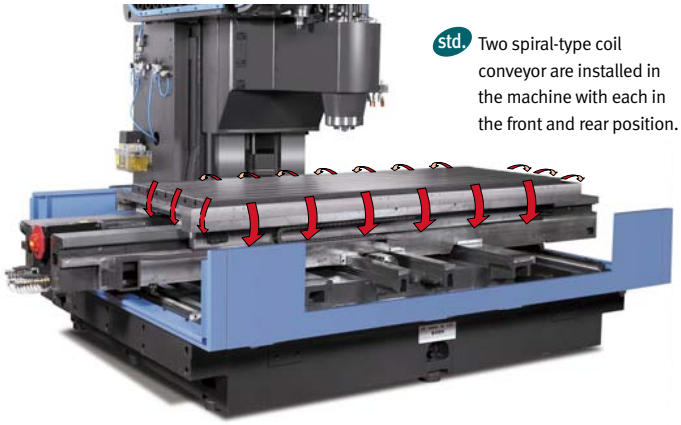
The coolant gun helps you work in a clean environment.

Spindle Head Cooling System

Spindle head cooling system to maintain the best spindle.

- Thermal displacement of the mandrel is minimized at the highest rotational speed (after 30 min. pre-heating)
- Since the oil jacket around the mandrel and heat generation parts of all moving units have the forced circulation of cooling lubricant of the oil cooling system, the whole mandrel maintains the uniform temperature to ensure high precision even during the high speed rotation.
  A refrigerated spindle cooling system circulates cooling oil to maintain a constant temperature for high accuracy, regardless of the ambient temperature or cutting conditions.

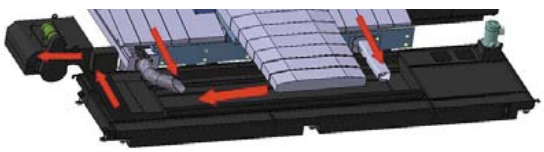
Easy Chip Disposal



std. Two spiral-type coil conveyor are installed in the machine with each in the front and rear position.

Proper disposal of cutting chips greatly affects productivity. During machining, the screw type chip conveyors provided as standard equipment, move chips to the chip buckets through the chip conveyor at the side of the machine.

The lift chip conveyor is used for faster chip disposal.



Machining Capacity

Superior surface finishes and machining accuracy are achieved through using standard processing solutions such as high-speed / high - precision contour control and thermal displacement compensation.

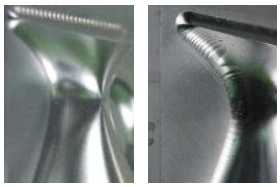
High Speed / High Precision Contour Control

* DSQ : Doosan Super Quality

Smoothes the movement of the machine, improving surface roughness and profile accuracy of corners and edges.

- DSQ1(AICC2_200 Block + Machining condition selection function) std.
- DSQ2(DSQ1 + Data server [1GB]) opt.
- DSQ3(DSQ2 + High speed processing _ 600 Block) opt.

Specimen tested :VASE

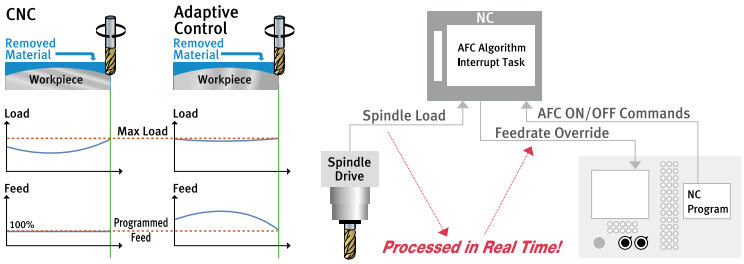


With DSQ | Without DSQ

The Optimal Feed Control opt.

* DAFC : Doosan Adaptive Feedrate Control

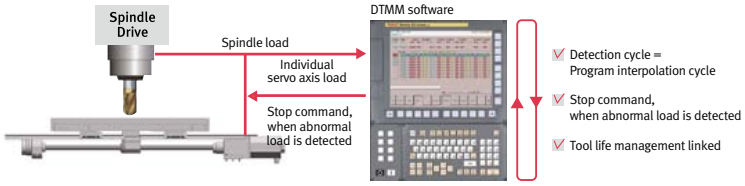
Optimal feed control is based on checking the load of spindle at real time.



High Efficient DTMM opt.

* DTMM : Doosan Tool load Monitoring for Machining Centers

The technology of protecting tool and machine in abnormal load during the cutting process.



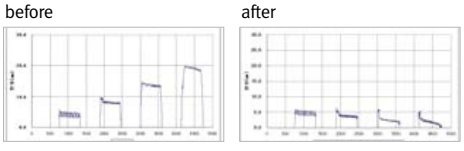
Smart thermal displacement multi compensation technology std.

* DSTC : Doosan Smart Thermal Control

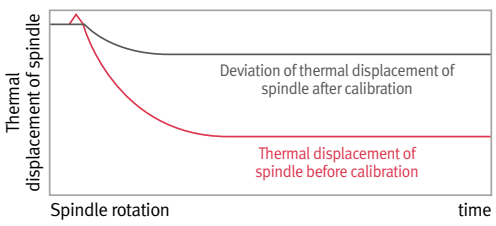
We materialized the minimization of thermal displacement so as to maintain high-recision in spite of long-time processing.

Calibration of static displacement of spindle

It enables to calibrate the change in position of tool through the expansion of spindle shaft at high-speed rotation.

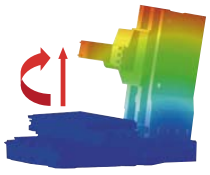


Calibration of dynamic displacement of spindle

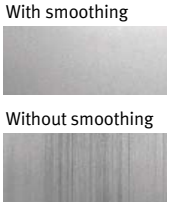


Calibration of structure thermal displacement

It calibrates inconsistent bending or expansion owing to the change in external temperature using a number of temperature sensors.



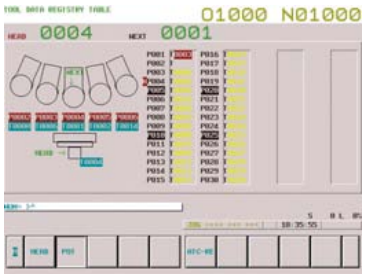
Thermal displacement compensation is achieved with 5 algorithm including smoothing function.



Easy Operation Package

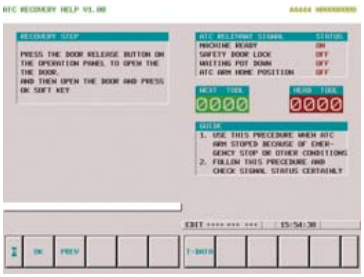
These Doosan software packages have been customised to provide fast and easy operation for tooling, workpiece and program set up. These features minimise the lost time caused by process setup and maximises the machine'productivity.

Operation / Maintenance



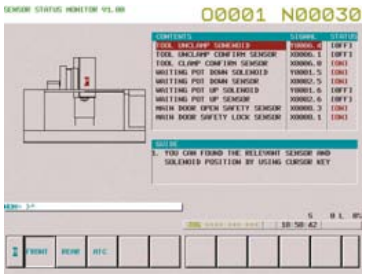
Tool Data Registry Table

Operator can edit & check the tool number of magazine pot.



ATC Recovery Help

It makes operator recovery of the ATC from alarm status easier.

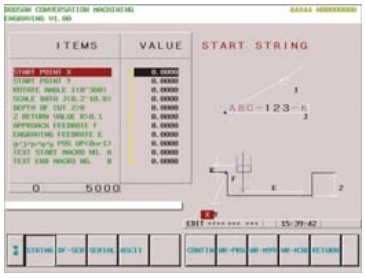


Sensor Status Monitor

Solenoid valve and Sensor status can be checked without the electric diagram.

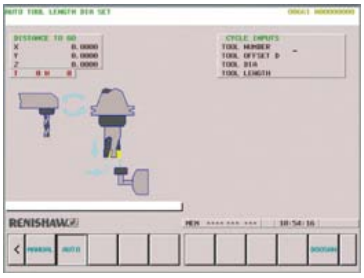
Tool Load Monitor opt.

The axis and spindle load in cutting are monitored which minimises damage to the tool.



Engraving opt.

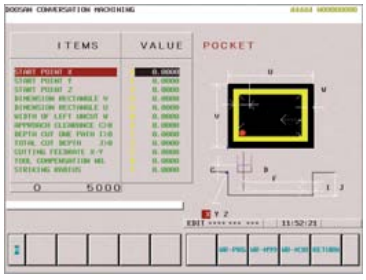
It makes number and letter engraving programming easier.



Renishaw Gui

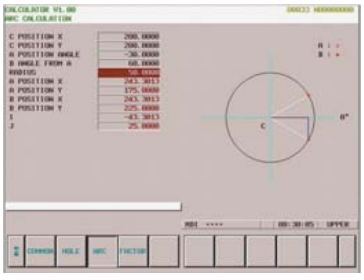
(Tool measure std.)
(Work measure opt.)

Tool & work measure system of Renishaw is operated on conversational screen.



Pattern Cycle

It is easy to make pattern cycle program by this funciton.



Calculator

Operator can easily calculate numerical formulas in relation to arc and hole patterns.

Machine Capacity

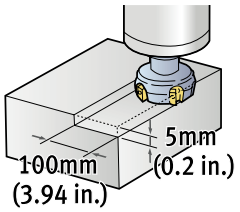
Provides high-productivity and high-accuracy in a variety of machining operations

VM 1260 [12000 r/min]

Face mill

Carbon steel (SM45C)

•ø125mm (4.92 in.) Face mill (8Z)



Machining rate
660 cm³/min (40.3 in³/min)

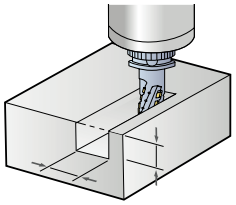
Spindle speed
500 r/min

Feedrate
1660 mm/min (65.4 ipm)

End mill

Carbon steel (SM45C)

•ø 63mm (2.5 in.) Endmill (4Z)



Machining rate
635 cm³/min (38.8 in³/min)

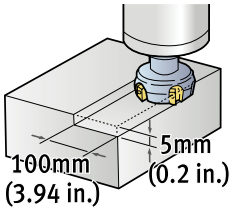
Spindle speed
500 r/min

Feedrate
320 mm/min (12.6 ipm)

Face mill

Gray casting (GC25)

•ø125mm (4.92 in.) Face mill (8Z)



Machining rate
1260 cm³/min (77 in³/min)

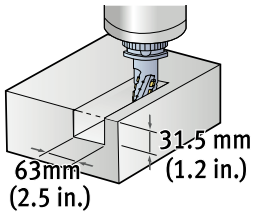
Spindle speed
500 r/min

Feedrate
2520 mm/min (99.2 ipm)

End mill

Gray casting (GC25)

•ø 63mm (2.5 in.) Endmill (4Z)



Machining rate
1012 cm³/min (61.8in³/min)

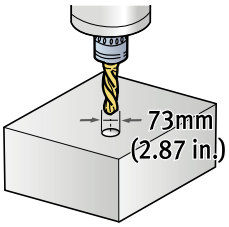
Spindle speed
500 r/min

Feedrate
320 mm/min (12.6 ipm)

Drill

Carbon steel (SM45C)

•ø73mm (2.87 in.) Drill (2Z)

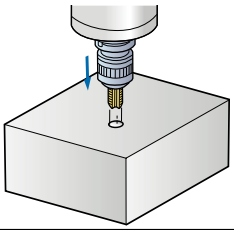


Spindle speed
500 r/min

Feedrate
140 mm/min (5.5 ipm)

Tap

Carbon steel (SM45C)



Tool
M42 x P4.5

Spindle speed
400 r/min

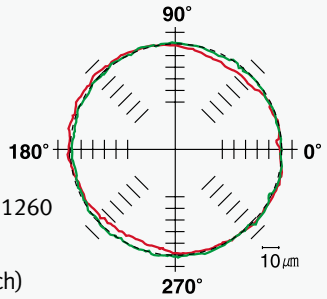
A standard rigid tapping function allows synchronized, high-speed tapping. This eliminates the need for special tap holders.

Machining Accuracy

For increased repeatability and reliability

Roundness

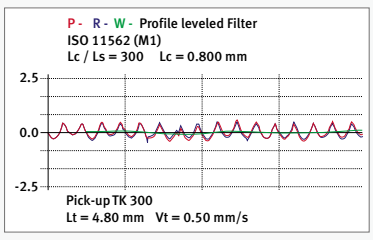
8.2 µm



- Model : VM 750 / 900 / 1260
- Material : Al6061
- Tool : ø10mm (ø0.39 inch)
  (Endmill : 3Z)

Roughness

Ra 0.22 µm



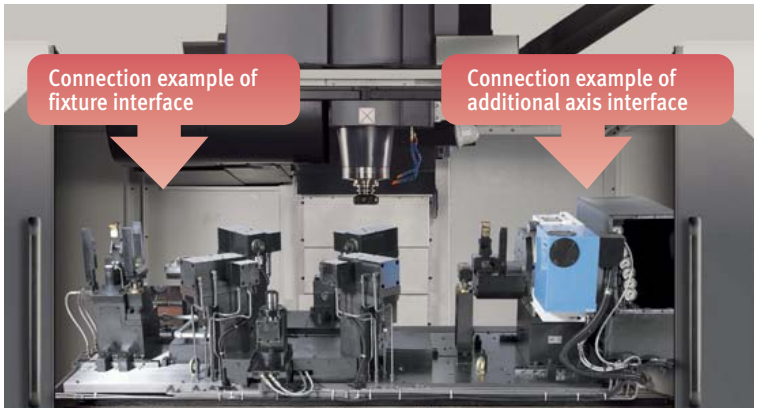
- Spindle speed : 6000 r/min
- Feedrate : 900 mm/min (359.4 ipm)

The results indicated in this catalog may not be obtained due to differences in environmental conditions during measurement and cutting conditions.

Optional Equipment

Operator's convenience and operability

Interface for Additional Axis



In case of additional axis, Hydraulic unit may be additionally necessary according to rotary table specification. Hydraulic power unit is an optional accessary for rotary table and hydraulic fixture line.

Recommandable rotary table size

VM 750/750L : ø320 mm (12.6 inch)
VM 960/960L : ø500 mm (19.7 inch)
VM 1260 : ø500 mm (19.7 inch)

Fixture check list (for hydraulic / pneumatic fixtures)

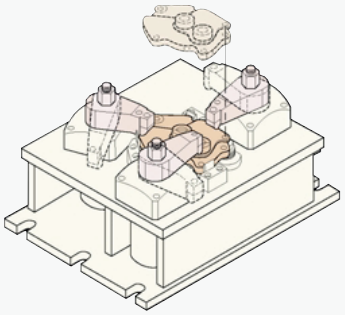
- **Pressure source**
  Hydraulic ☐ P/T ☐ A/B
  Pneumatic ☐ P/T ☐ A/B

- **Number of ports**
  ☐ 1pair (2-PT 3/8"port)
  ☐ 2pair (4-PT 3/8"port)

- **Hydraulic power unit**
  Supply scope : ☐ User ☐ DOOSAN
  (Please check the below detail specification, if you want Doosan to supply.)

  ☐ Use Doosan standard unit
  24 L/min (45 bar)

  ☐ Special requirement
  _____ L / min (gal/min) at _____MPa (psi)



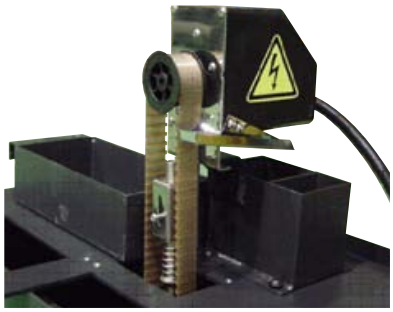
※ Contact Doosan for more information

Through the spindle coolant

Minimum quantity lublication

Misting device

Oil skimmer



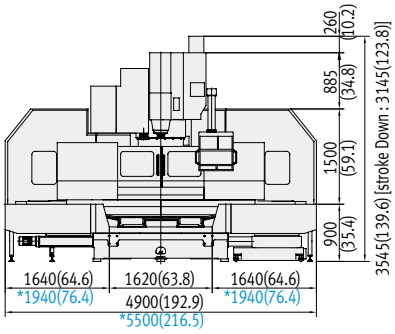
External Dimensions

VM 750/750L (Half Cover) std.

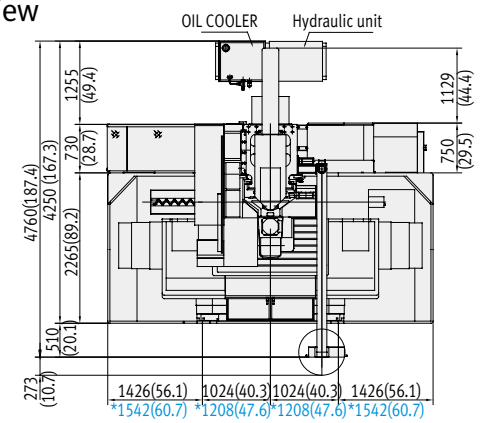
* : VM 750L

Unit : mm (inch)

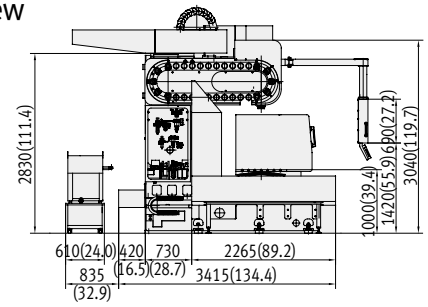
Front View



Top View



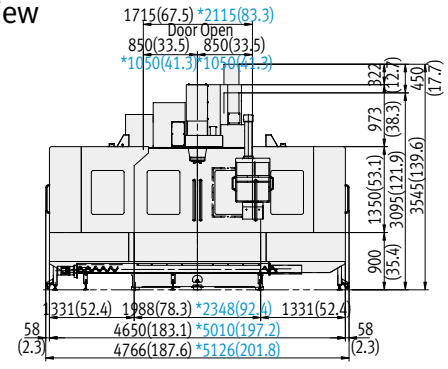
Side View



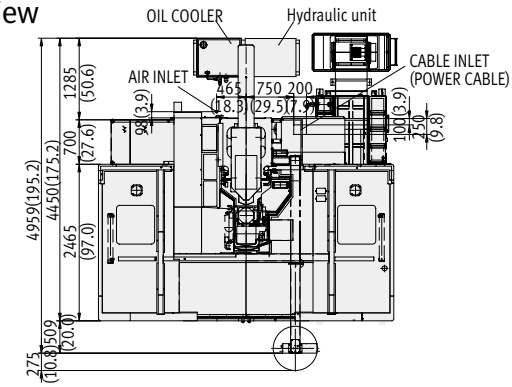
VM 750/750L (Full Cover) opt.

* : VM 750L

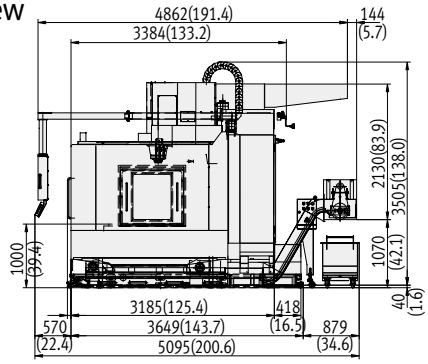
Front View



Top View



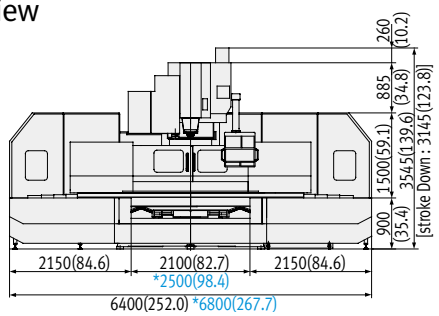
Side View



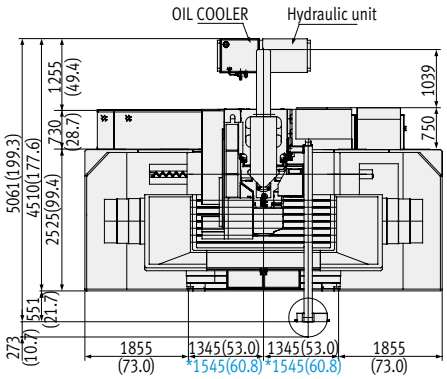
VM 960/960L (Half Cover) std. * : VM 960L

Unit : mm (inch)

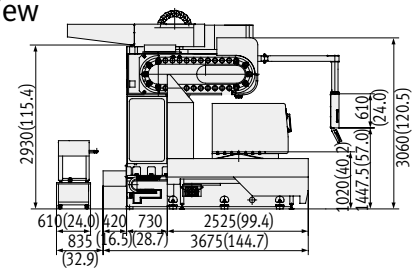
Front View



Top View

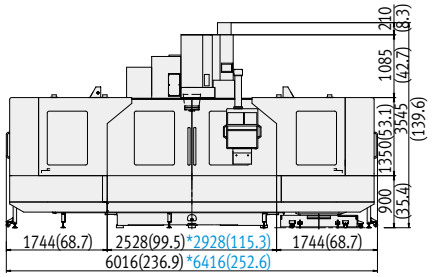


Side View

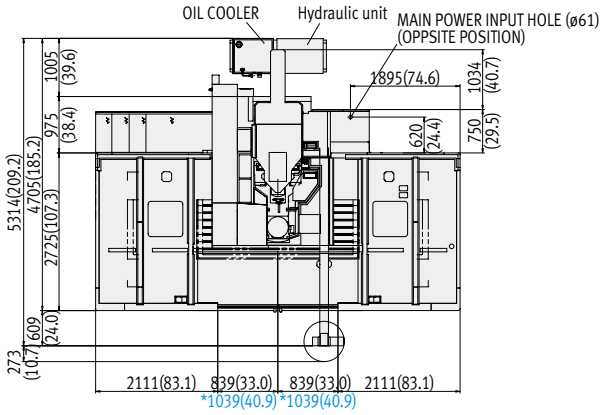


VM 960/960L (Full Cover) opt. * : VM 960L

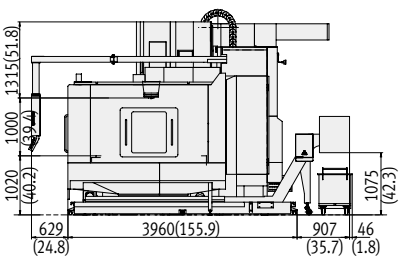
Front View



Top View



Side View

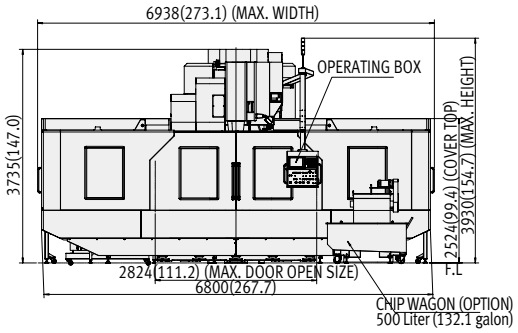


External Dimensions

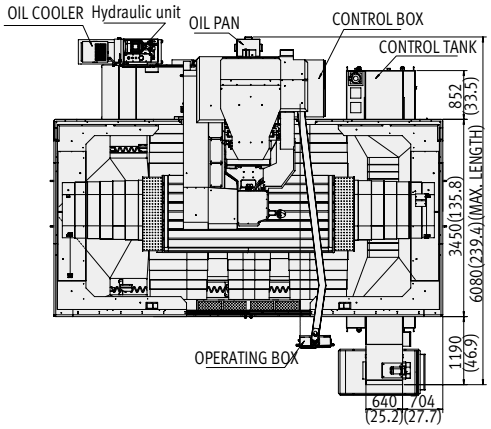
VM 1260 (Full Cover) std.

Unit : mm (inch)

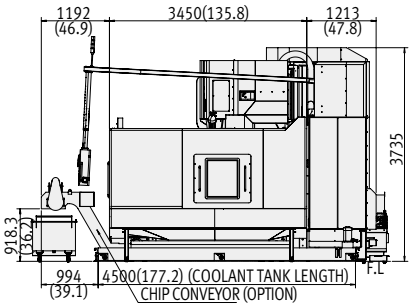
Front View



Top View



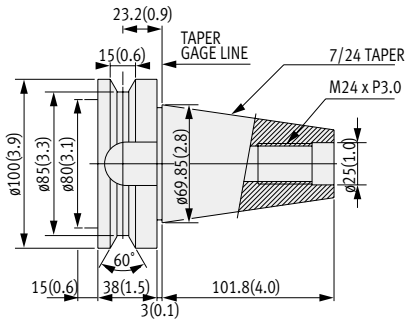
Side View

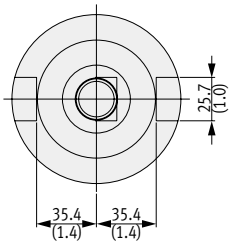


Tool Shank

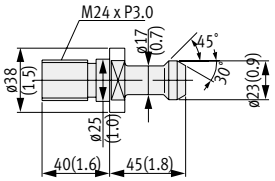
BT50

MAS403P BT 50 std.

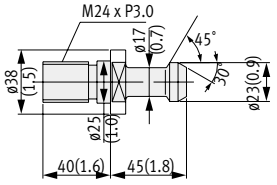




MAS403P50T-I(45) std.



MAS403P50T-II(60) opt.

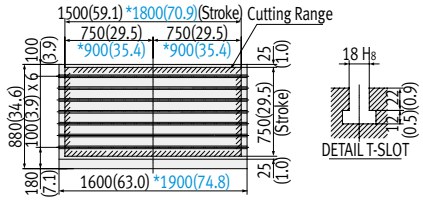


Table

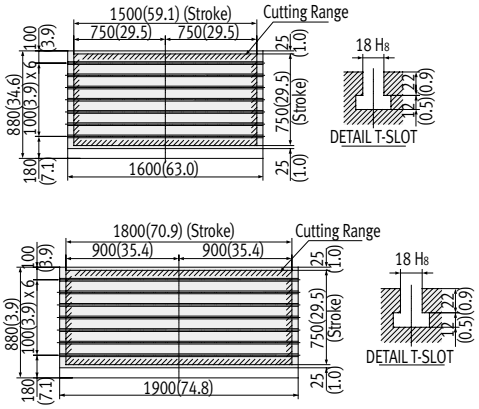
Unit : mm (inch)

VM 750/750L (Half Cover) std.

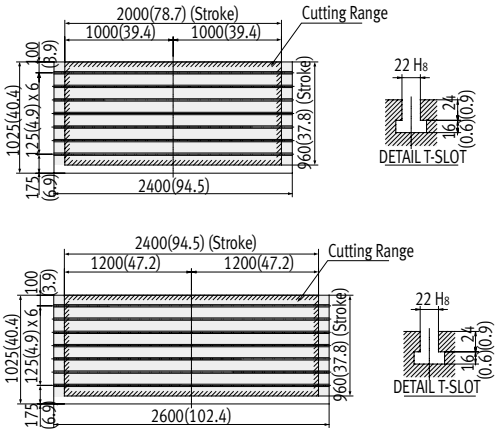
* : VM 750L



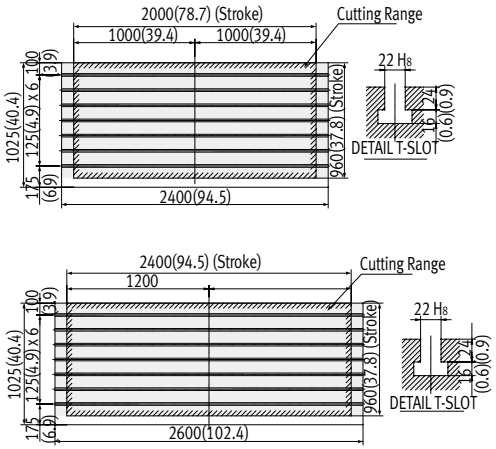
VM 750/750L (Full Cover) opt.



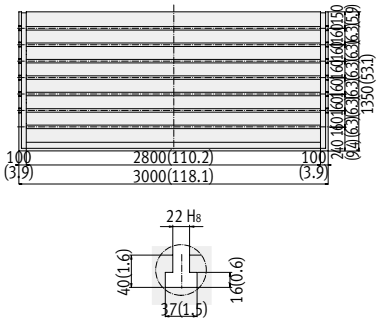
VM 960/960L (Half Cover) std.



VM 960/960L (Full Cover) opt.



VM 1260 (Full Cover) std.



T-slot section

Machine Specifications

	Features	Unit	VM 750	VM 750L	VM 960	VM 960L	VM 1260
Travels	X-axis	mm (inch)	1500 (59.1)	1800 (70.9)	2000 (78.7)	2400 (94.5)	2500 (98.4)
	Y-axis	mm (inch)	750 (29.5)		960 (37.8)		1260 (49.6)
	Z-axis	mm (inch)	800 (31.5)				900 (35.4)
	Distance from spindle nose to table top	mm (inch)	200-1000 (7.9-39.4)				200-1100 (7.9-43.3)
	Distance from spindle center to column guideway	mm (inch)	865 (34.1)		1005 (39.6)		1320 (52)
Feedrate	Rapid traverse rate (X / Y / Z)	m/min (ipm)	20/20/20 (787.4/787.4/787.4)		16/16/16 (629.9/629.9/629.9)		12/12/12 (472.4/472.4/472.4)
	Cutting feedrate	m/min (ipm)	10000		8000		6000
Table	Table size	mm (in.)	1600 x 800 (63 x 31.5)	1900 x 800 (74.8 x 31.5)	2400 x 950 (94.5 x 37.4)	2600 x 950 (102.4 x 37.4)	2800 x 1260 (110.2 x 49.6)
	Table loading capacity	kg (lb)	3000 (6613.8)	3500 (7716.1)	4000 (8818.4)	4500 (9920.7)	8000 (17636.7)
	Table surface		7-100 x 18H8		7-125 x 22H8		7-160 x 22H8
Spindle	Max. spindle speed	r/min	6000{6000,6000,12000}				
	Spindle taper		ISO#50 7/24 Taper				
	Max. spindle torque	N·m (ft-lbs)	561.5 (414.4)				668.4 (493.3)
ATC	Type of tool shank		MAS403 BT50				
	Tool storage capacity	ea	30		30 {40}		40
	Max. tool diameter	mm (in.)	ø125 (4.9)				
	Max. tool diameter without adjacent tools	mm (in.)	ø230 (9.1)				
	Max. tool length	mm (in.)	350 (13.8)				
	Max. tool weight	kg (lb)	15 (33.1)				
	Method of tool selection		Memory Random				
	Tool change time (tool-to-tool)	s	2.5				
	Tool change time (chip-to-chip)	s	6		8		
Motors	Spindle motor (30min)	kW (Hp)	18.5 (24.8) {22 / 26 / 30 (29.5 / 34.9 / 40.2)}				22 (29.5)
	Feed motor (X / Y / Z)	kW (Hp)	7 / 7 / 7 (9.4 / 9.4 / 9.4)				9 / 9 / 7 (12.1 / 12.1 / 9.4) {26/30 (34.9/40.2)}
Power source	Electric power supply (Rated Capacity)	kVA	60 {75}				65 {73}
	Compressed air supply	Mpa (psi)	0.54 (78.3)				
Tank capacity	Coolant tank capacity	L (galon)	480 (126.8)				800 (211.4)
	Lubrication tank capacity	L (galon)	3.1 (0.8)				
Machine size	Height	mm (in.)	3545 (139.6)				3930 (154.7)
	Dimension (L x W)	mm (in.)	4927 x 4900 (194.0 x 192.9) {5126 x 4766 (201.8 x 187.6) }	4927 x 5500 (194.0 x 216.5) {5126 x 5126 (201.8 x 201.8)}	5138 x 6400 (202.3 x 252.0) {5392 x 6016 (212.3 x 236.9)}	5138 x 6800 (202.3 x 267.7) {5392 x 6416 (212.3 x 252.6)}	5645 x 6938 (222.2 x 273.1)
	Weight	kg (lb)	14000 (30864)	14800 (32628)	20000 (44092)	21000 (46297)	31000 (68343)

Note : { } are optional.

Standard Feature

- Assembly & operation tools
- Automatic power off
- Coolant tank & chip conveyor ready
- Doosan smart thermal control
- Fanuc 31i-A controller
- Full enclosure splash guard
- Installation parts
- Portable 3MPG
- Screw conveyor
- Signal tower (red, yellow, green)
- Spindle head cooling system
- Work light

Optional Feature

- 4th axis preparation
- Automatic front door
- Automatic measuring system
- Automatic tool length measurement with sensor
- Chip conveyor
- Chip bucket
- Electric power transformer
- Oil skimmer
- Shower coolant
- Test bar
- Through spindle coolant
- Rotary table
  ø320mm (12.6 inch) (VM 750/750L)
  ø500mm (19.7 inch) (VM 960/960L/1260)

- The specifications and information above-mentioned may be changed without prior notice.
- For more details, please contact Doosan

NC Unit Specifications

Fanuc 31i

AXES CONTROL

- Controlled axes	3 (X,Y,Z)
- Simultaneously controllable axes	Positioning (G00) / Linear interpolation (G01) : 3 axes Circular interpolation (G02, G03) : 2 axes
- Backlash compensation	
- Emergency stop / overtravel	
- Follow up	
- Least command increment	0.001mm / 0.0001"
- Least input increment	0.001mm / 0.0001"
- Machine lock	all axes / Z axis
- Mirror image	Reverse axis movement (setting screen and M - function)
- Stored pitch error compensation	Pitch error offset compensation for each axis
- Stored stroke check 1	Overtravel controlled by software

INTERPOLATION & FEED FUNCTION

- 2nd reference point return	G30
- Circular interpolation	G02, G03
- Dwell	G04
- Exact stop check	G09, G61
- Feed per minute	mm / min
- Feedrate override	0 - 200 %
- Jog override	0 - 200 %
- Linear interpolation	G01
- Manual handle feed 1 unit	
- Manual handle feed 2 / 3 unit	
- Manual handle feedrate	0.1/0.01/0.001mm
- Override cancel	M48 / M49
- Positioning	G00
- Rapid traverse override	F0 (fine feed), 25 / 50 / 100 %
- Reference point return	G27, G28, G29
- Skip function	G31
- Helical interpolation	
- DSQ1(AICC II + Machine condition selection function)	200 block preview
- Thread cutting, synchronous cutting	
- Program restart	
- Automatic corner deceleration (Specify AI Contour control II)	
- Feedrate clamp by circular acceleration	
- Linear ACC / DEC before interpolation (Specify AI Contour control II)	
- Linear ACC / DEC after interpolation	
- Control axis detach	
- Rapid traverse bell-shaped acceleration / deceleration	
- Smooth backlash compensation	

SPINDLE & M-CODE FUNCTION

- M-code function	M3 digits
- Spindle orientation	
- Spindle serial output	
- Spindle speed command	S5 digits
- Spindle speed override (10% increments)	10 - 150 %
- Spindle output switching	
- Retraction for rigid tapping	
- Rigid tapping	G84, G74

TOOL FUNCTION

- Tool nose radius compensation	G40, G41, G42
- Number of tool offsets	64 ea
- Tool length compensation	G43, G44, G49
- Tool number command	T2 digits
- Tool life management	Geometry / Wear and Length / Radius offset memory
- Tool offset memory C	
- Tool length measurement	

PROGRAMMING & EDITING FUNCTION

- Absolute/Incremental programming	G90 / G91
- Auto. Coordinate system setting	
- Canned cycle	G73, G74, G76, G80 - G89, G99
- Circular interpolation by radius programming	
- Custom macro B	
- Custom size 512Kb	
- Decimal point input	
- I / O interface	RS - 232C
- Inch / metric conversion	G20 / G21
- Label skip	
- Local / Machine coordinate system	G52 / G53
- Maximum commandable value	±99999.999mm (±9999.9999 inch)
- No. of Registered programs	500 ea
- Optional stop	M01
- Part program storage	640 m
- Program number	O4-digits
- Program protec	
- Program stop / end	M00 / M02, M30
- Programmable data input	Tool offset and work offset are entered by G10, G11
- Sub program	Up to 4 nesting
- Tape code	ISO / EIA Automatic discrimination
- Work coordinate system	G54 - G59
- Additional work coordinate system (48 Pair)	G54.1 P1 - 48 pairs
- Coordinate system rotation	G68, G69
- Extended part program editing	
- Optional angle chamfering / corner R	
- Macro executor	

OTHERS FUNCTIONS (Operation, Setting & Display, etc)

- Alarm display	
- Alarm history display	
- Clock function	
- Cycle start / Feed hold	
- Display of PMC alarm message	Message display when PMC alarm occurred
- Dry run	
- Ethernet function(Embeded)	
- Graphic display	Tool path drawing
- Help function)	
- Loadmeter display	
- MDI / DISPLAY unit	10.4" Color TFT LCD, Keyboard for data input, soft-keys
- Memory card interface	
- Operation functions	Tape / Memory / MDI / Manual
- Operation history display	
- Program restart	
- Run hour and part number display	
- Search function	Sequence NO. / Program NO.
- Self - diagnostic function	
- Servo setting screen	
- Single block	
- External data input	
- Multi language display	

OPTIONAL SPECIFICATIONS

- 3-dimensional coordinate conversion	
- 3-dimensional tool compensation	
- 3rd / 4th reference return	
- Addition of tool pairs for tool life management	1024 pairs
- Additional controlled axes	max. 6 axes in total
- Additional work coordinate system	G54.1 P1 - 300 (300 pairs)
- DSQ 2	200 block preview (AICC II + Machine condition selection function + Data server + 1GB)
- DSQ 3	600 block preview (AICC II with High speed processing + Machine condition selection function + Data server + 1GB)
- Automatic corner override	G62
- Chopping function	G81.1
- Cylindrical interpolation	G07.1
- Dynamic graphic displayMachining profile drawing	
- Exponential interpolation	
- Interpolation type pitch error compensation	
- EZ Guide i (Doosan infracore Conversational Programming Solution)	with 10.4" Color TFT LCD
- Increment system 1 / 10	
- Figure copying	G72.1, G72.2
- High speed skip function	
- Involute interpolation	G02.2, G03.2
- Machining time stamp function	
- No. of Registered programs	1000 ea
- Number of tool offsets	99 / 200 / 400 / 499 / 999 / 2000 ea
- Optional block skip addition	9 blocks
- Part program storage	1280 / 2560 m
- Playback function	
- Polar coordinate command	G15 / G16
- Polar coordinate interpolation	G12.1 / G13.1
- Programmable mirror image	G50.1 / G51.1
- Single direction positioning	G60
- Stored stroke check 2 / 3	
- Tool load monitoring function (doosan)	
- Tool position offset	G45 - G48
- Position switch	

http://www.doosaninfracore.com/machinetools/

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